WHAT IS CLAIMED IS:

1. A process for the hydrogenation of an imine with hydrogen under elevated pressure in the presence of an iridium catalyst and with or without an inert solvent, wherein the reaction mixture contains an ammonium chloride, bromide or iodide, or a metal chloride, bromide or iodide that is soluble in the reaction mixture, and additionally contains an acid.

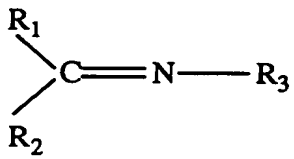
2. A process according to claim 1, wherein the imine contains at least one $>C=N-$ group.

3. A process according to claim 1, wherein the imine contains at least one of the groups $>C=N-$ and $>C=N-N-$ and additionally unsaturated groups $>C=C<$ and $>C=O$.

4. A process according to claim 3, wherein the free bonds are saturated with hydrogen or organic radicals having from 1 to 22 carbon atoms or organic hetero radicals having from 1 to 20 carbon atoms, and at least one hetero atom from the group O, S, N and P; or the nitrogen atom of the group $>C=N-$ is saturated with NH_2 or a primary amino group having from 1 to 22 carbon atoms or a secondary amino group having from 2 to 40 carbon atoms.

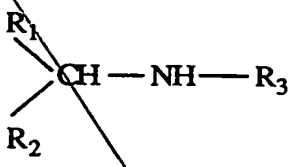
5. A process according to claim 1, wherein an aldimine, ketimine or hydrazone is hydrogenated.

6. A process according to claim 5, wherein the imine is an imine of formula I



(I),

which is hydrogenated to form an amine of formula II



(II)

wherein

R_3 is linear or branched C_1-C_{12}alkyl, cycloalkyl having from 3 to 8 ring carbon atoms; heterocycloalkyl bonded *via* a carbon atom and having from 3 to 8 ring atoms and 1 or 2 hetero atoms from the group O, S and NR_6; a C_7-C_{16}aralkyl bonded *via* an alkyl carbon atom, or C_1-C_{12}alkyl substituted by the mentioned cycloalkyl or heterocycloalkyl or heteroaryl;

or wherein

R_3 is C_6-C_{12}aryl, or C_4-C_{11}heteroaryl bonded *via* a ring carbon atom and having 1 or 2 hetero atoms in the ring; R_3 being unsubstituted or substituted by -CN, -NO_2, F, Cl, C_1-C_{12}alkyl, C_1-C_{12}alkoxy, C_1-C_{12}alkylthio, C_1-C_6haloalkyl, -OH, C_6-C_{12}-aryl or -aryloxy or -arylthio, C_7-C_{16}-aralkyl or -aralkoxy or -aralkylthio, secondary amino having from 2 to 24 carbon atoms, -$CONR_4R_5$ or by -$COOR_4$, and the aryl radicals and the aryl groups in the aralkyl, aralkoxy and aralkylthio in turn being unsubstituted or substituted by -CN, -NO_2, F, Cl, C_1-C_4-alkyl, -alkoxy or -alkylthio, -OH, -$CONR_4R_5$ or by -$COOR_4$;

R_4 and R_5 are each independently of the other hydrogen, C_1-C_{12}alkyl, phenyl or benzyl, or R_4 and R_5 together are tetra- or penta-methylene or 3-oxapentylene;

R_6 has independently the same meaning as given for R_4;

R_1 and R_2 are each independently of the other a hydrogen atom, C_1-C_{12}alkyl or cycloalkyl having from 3 to 8 ring carbon atoms, each of which is unsubstituted or substituted by -OH, C_1-C_{12}alkoxy, phenoxy, benzyloxy, secondary amino having from 2 to 24 carbon atoms, -$CONR_4R_5$ or by -$COOR_4$; C_6-C_{12}aryl or C_7-C_{16}aralkyl that is unsubstituted or substituted as R_3, or -$CONR_4R_5$ or -$COOR_4$, wherein R_4 and R_5 are as defined hereinbefore; or

R_3 is as defined hereinbefore and R_1 and R_2 together are alkylene having from 2 to 5 carbon atoms that is optionally interrupted by 1 or 2 -O-, -S- or -NR_6- radicals, and/or unsubstituted or substituted by =O or as R_1 and R_2 above in the meaning of alkyl, and/or condensed with benzene, pyridine, pyrimidine, furan, thiophene or pyrrole; or

R_2 is as defined hereinbefore and R_1 and R_3 together are alkylene having from 2 to 5 carbon atoms that is optionally interrupted by 1 or 2 -O-, -S- or -NR_6- radicals, and/or

unsubstituted or substituted by =O or as R_1 and R_2 above in the meaning of alkyl, and/or condensed with benzene, pyridine, pyrimidine, furan, thiophene or pyrrole.

7. A process according to claim 5, wherein R_1 and R_2 as heteroaryl form a 5- or 6-membered ring having 1 or 2 identical or different hetero atoms.

8. A process according to claim 5, wherein R_1 and R_2 as heteroaryl-substituted alkyl are derived from a 5- or 6-membered ring having 1 or 2 identical or different hetero atoms.

9. A process according to claim 5, wherein R_1 and R_2 as heterocycloalkyl or as heterocycloalkyl-substituted alkyl contain from 4 to 6 ring atoms and 1 or 2 identical or different hetero atoms from the group O, S and NR_6, wherein R_6 is hydrogen, C_1-C_{12}alkyl, phenyl or benzyl.

10. A process according to claim 5, wherein R_1, R_2 and R_3 as alkyl are unsubstituted or substituted C_1-C_6alkyl.

11. A process according to claim 5, wherein R_1, R_2 and R_3 as unsubstituted or substituted cycloalkyl contain from 3 to 6 ring carbon atoms.

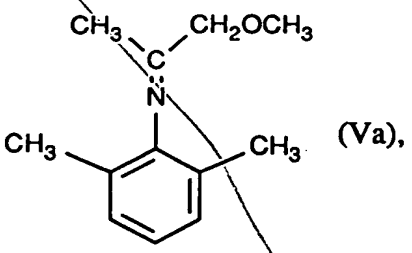
12. A process according to claim 5, wherein R_1, R_2 and R_3 as aryl are unsubstituted or substituted naphthyl or phenyl, and R_1, R_2 and R_3 as aralkyl are unsubstituted or substituted phenylalkyl having from 1 to 10 carbon atoms in the alkylene.

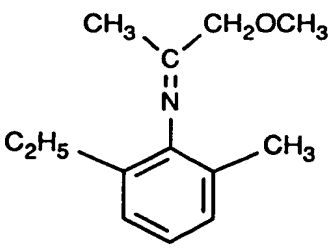
13. A process according to claim 5, wherein R_1 and R_2 together or R_1 and R_3 together form, with the carbon atom or the -N=C group to which they are bonded, respectively, a 5- or 6-membered ring.

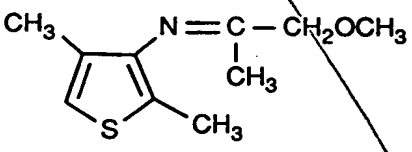
14. A process according to claim 5, wherein in formula I R_3 is 2,6-di-C_1-C_4alkylphen-1-yl, R_1 is C_1-C_4alkyl, and R_2 is C_1-C_4alkyl, C_1-C_4alkoxymethyl or C_1-C_4alkoxyethyl.

15. A process according to claim 14, wherein R_3 is 2,6-dimethylphen-1-yl or 2-methyl-6-ethylphen-1-yl, R_1 is ethyl or methyl, and R_2 is methoxymethyl.

16. A process according to claim 6, wherein the imine corresponds to the formula


(Va),


(Vb) or


(Vc).

17. A process according to claim 1, wherein the iridium catalyst is a homogeneous catalyst that is substantially soluble in the reaction medium.

18. A process according to claim 1, wherein the catalyst corresponds to the formula III, IIIa, IIIb, IIIc or IIId

$[XIrYZ]$ (III), $[XIrY]^{\oplus}A^{\ominus}$ (IIIa),

$[YIrZ_4]^{\ominus}M^{\oplus}$ (IIIb), $[YIrHZ_2]_2$ (IIIc),

$[YIrZ_3]_2$ (IIId),

wherein X is two olefin ligands or a diene ligand, Y is a diphosphine having secondary phosphine groups

(a) the phosphine groups of which are bonded to a carbon chain having from 2 to 4 carbon atoms, or

(b) the phosphine groups of which are either bonded directly or *via* a bridge group $-CR_aR_b-$ in the ortho positions of a cyclopentadienyl ring or are each bonded to a cyclopentadienyl ring of a ferrocenyl, or

(c) one phosphine group of which is bonded to a carbon chain having 2 or 3 carbon atoms and the other phosphine group of which is bonded to an oxygen atom or a nitrogen atom bonded terminally to that carbon chain, or

(d) the phosphine groups of which are bonded to the two oxygen atoms or nitrogen atoms bonded terminally to a C_2-carbon chain;

with the result that in the cases of (a), (b), (c) and (d) a 5-, 6- or 7-membered ring is

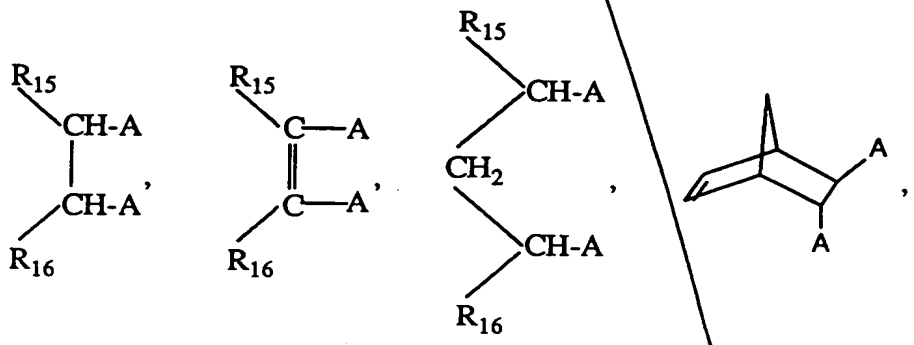
formed together with the Ir atom, the radicals Z are each independently of the other(s) Cl, Br or I, $A^{\ominus}$ is the anion of an oxy or complex acid, and $M^{\oplus}$ is an alkali metal cation or quaternary ammonium, and R_a and R_b are each independently of the other hydrogen, C_1-C_8alkyl, C_1-C_4fluoroalkyl, phenyl or benzyl or are phenyl or benzyl having from 1 to 3 C_1-C_4alkyl or C_1-C_4alkoxy substituents.

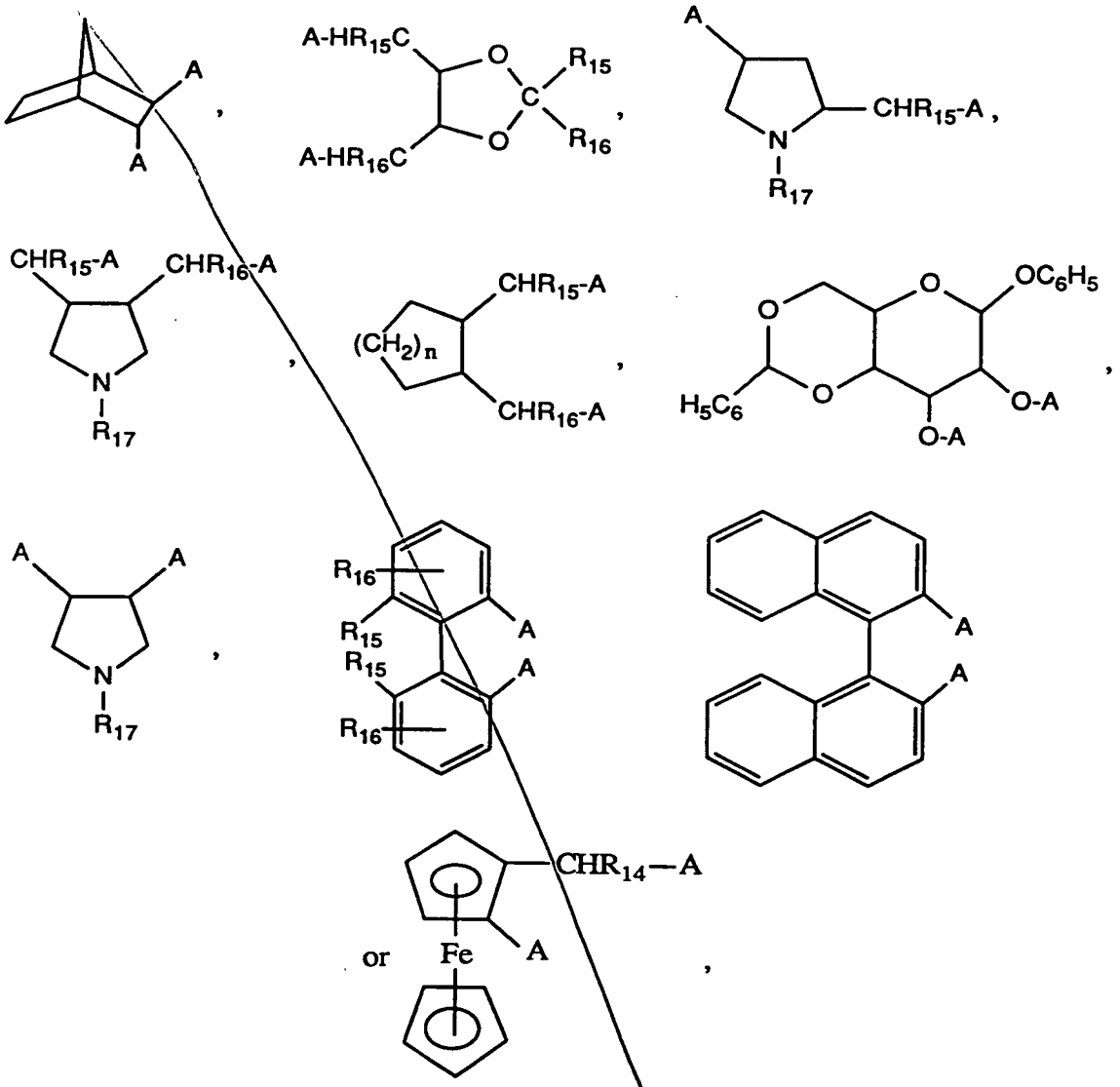
19. A process according to claim 18, wherein the diphosphine Y contains at least one chiral carbon atom.

20. A process according to claim 18, wherein X as an olefin ligand is branched or linear C_2-C_{12}alkylene; and X as a diene ligand is an open-chain or cyclic diene having from 4 to 12 carbon atoms.

21. A process according to claim 18, wherein the secondary phosphine groups contain two identical or different radicals from the following group: linear or branched C_1-C_{12}alkyl; unsubstituted or C_1-C_6alkyl- or C_1-C_6alkoxy-substituted C_5-C_{12}cycloalkyl, C_5-C_{12}cycloalkyl-CH_2-, phenyl or benzyl; or phenyl or benzyl substituted by halogen (e.g. F, Cl or Br), C_1-C_6haloalkyl, $(C_1$-$C_{12}alkyl)_3Si$, $(C_6H_5)_3Si$, C_1-C_6haloalkoxy (e.g. trifluoromethoxy), $-NH_2$, $phenyl_2N$-, $benzyl_2N$-, morpholinyl, piperidinyl, pyrrolidinyl, $(C_1$-$C_{12}alkyl)_2N$-, -ammonium-$X_1^{\ominus}$, $-SO_3M_1$, $-CO_2M_1$, $-PO_3M_1$ or by -COO-C_1-C_6alkyl (e.g. $-COOCH_3$), wherein M_1 is an alkali metal or hydrogen and $X_1^{\ominus}$ is the anion of a monobasic acid.

22. A process according to claim 18, wherein the diphosphine Y is of the formula:





wherein

R_{15} and R_{16} are each independently of the other hydrogen, C_1-C_4alkyl, phenyl, benzyl, or phenyl or benzyl having from 1 to 3 C_1-C_4alkyl or C_1-C_4alkoxy substituents,

R_{14} is hydrogen, C_1-C_4alkyl, phenyl, benzyl, or phenyl or benzyl having from 1 to 3 C_1-C_4alkyl or C_1-C_4alkoxy substituents,

R_{17} is hydrogen, C_1-C_4alkyl, phenyl, benzyl, C_1-C_6alkoxy-CO-, C_1-C_6alkyl-CO-, phenyl-CO-, naphthyl-CO- or C_1-C_4alkylNH-CO-,

A may be identical or different groups -PR_2, wherein R is C_1-C_6alkyl, cyclohexyl, phenyl, benzyl, or phenyl or benzyl having from 1 to 3 C_1-C_4alkyl, C_1-C_4alkoxy, -CF_3 or partially or fully fluorinated C_1-C_4alkoxy substituents, and

n is 0, 1 or 2.

23. A process according to claim 18, wherein the diphosphine Y is
{(R)-1-[(S)-2-diphenylphosphino)ferrocenyl]}ethyl-di(3,5-dimethyl-phenyl)phosphine
{(R)-1-[(S)-2-diphenylphosphino)ferrocenyl]}ethyl-di(3,5-dimethyl-4-N,N-dipropyl-aminophenyl)phosphine
{(R)-1-[(S)-2-diphenylphosphino)ferrocenyl]}ethyl-di(3,5-diisopropyl-4-N,N-dimethyl-aminophenyl)phosphine
{(R)-1-[(S)-2-diphenylphosphino)ferrocenyl]}ethyl-di(3,5-diisopropyl-4-N,N-dibenzylyl-aminophenyl)phosphine
{(R)-1-[(S)-2-diphenylphosphino)ferrocenyl]}ethyl-di(3,5-dimethyl-4-N,N-dibenzylyl-aminophenyl)phosphine
{(R)-1-[(S)-2-diphenylphosphino)ferrocenyl]}ethyl-di(3,5-dimethyl-4-(1'-pyrrolo)-phenyl)phosphine
{(R)-1-[(S)-2-diphenylphosphino)ferrocenyl]}ethyl-di(3,5-dimethyl-4-N,N-dipentyl-aminophenyl)phosphine
{(R)-1-[(S)-2-diphenylphosphino)ferrocenyl]}ethyl-di(3,5-dimethyl-4-N,N-dimethyl-aminophenyl)phosphine
1,4-bis(diphenylphosphino)butane or
{(R)-1-[(S)-2-di(4-methoxyphenyl)phosphino)ferrocenyl]}ethyl-di(3,5-dimethyl-4-N,N-dimethylaminophenyl)phosphine.

24. A process according to claim 1, wherein the ammonium chloride, bromide or iodide, or the metal chloride, bromide or iodide that is soluble in the reaction mixture, is used in an amount of from 0.01 to 200 mol %, based on the iridium catalyst.

25. A process according to claim 1, wherein the metal chloride, bromide or iodide used is an alkali metal chloride, bromide or iodide.

26. A process according to claim 1, wherein the ammonium or alkali metal chloride, bromide or iodide is a tetraalkylammonium chloride, bromide or iodide having from 1 to 6 carbon atoms in the alkyl groups or in the case of an alkali metal chloride, bromide or iodide is a sodium, lithium or potassium chloride, bromide or iodide.

27. A process according to claim 1, wherein the acid is an inorganic or organic acid.

28. A process according to claim 1, wherein the acid is used in an amount of from 0.001 to 50 % by weight, preferably 0.1 to 50 % by weight, based on the imine.

29. A process according to claim 27, wherein the organic acid is an aliphatic or aromatic carboxylic acid, sulfonic acid or phosphorus(V) acid.

30. A process according to claim 27, wherein the organic acid is acetic acid, propionic acid, trifluoroacetic acid, chloroacetic acid or methanesulfonic acid, and the inorganic acid is H_2SO_4.

31. A process according to claim 1, wherein the molar ratio of the imine to the iridium catalyst is from 500 000 to 20.

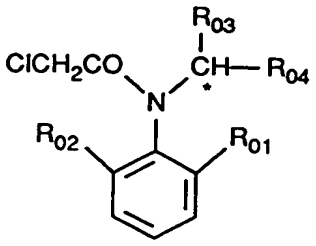
32. A process according to claim 1, wherein the reaction temperature is from -20 to 100°C.

33. A process according to claim 1, wherein the hydrogen pressure is from 5 to 150 bar.

34. A process according to claim 1, wherein the hydrogenation is carried out in a loop reactor.

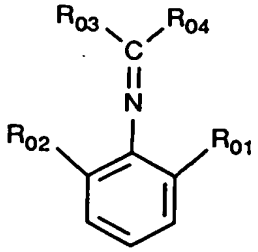
35. A process according to claim 1, wherein an aldimine or a ketimine formed *in situ* before or during the hydrogenation is hydrogenated.

36. A process for the preparation of a compound of the formula



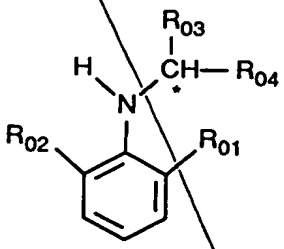
(IV),

wherein R_{01}, R_{02} and R_{03} are each independently of the other C_1-C_4alkyl, and R_{04} is C_1-C_4alkyl or C_1-C_4alkoxymethyl or C_1-C_4alkoxyethyl, by (1) hydrogenation of an imine of the formula



(V)

with hydrogen in the presence of an iridium catalyst and with or without an inert solvent to form an amine of the formula



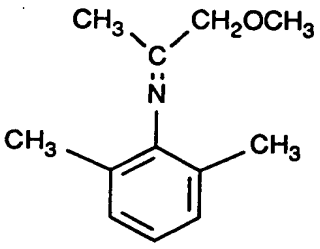
(VI)

and (2) reaction thereof with the compound of formula

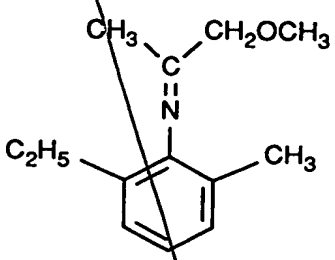
$ClCH_2CO\text{-}Cl$ (VII),

wherein in the hydrogenation the reaction mixture contains an ammonium chloride, bromide or iodide, or a metal chloride, bromide or iodide that is soluble in the reaction mixture, and additionally contains an acid.

37. A process according to claim 36, wherein the imine used is a compound of the formula



(Va) or



(Vb).